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:! incontinence assessment in elderly inpatient men

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—Urinary incontinence is a major problem for ... chronic care patients. As a consequence, a high level of nursing care is required for patient management. Because incontinence rehabilitation programs are usually implemented during the day shift, the incidence of incontinence according to time of day has major implications regarding patient management. Although treatment is usually based on severity, assessment of incontinence ... in elderly chronic care inpatients is difficult. In ... a telemetric incontinence detection system was ... to identify incontinence episodes. An absorbent pad exchange technique was used for incontinence volume measurement. The study group, 66 chronic care inpatient men over 65 years old, were subject to incontinence measurements over 10 days during all nursing shifts using the telemetric incontinence detection system. The results showed a significantly high incidence of inconti- ... episodes during the evening nursing shift. The ... of involuntary urine loss was significantly higher ... the night nursing shift. Thus, the highest level of incontinence severity occurred during the time of day when nursing staff on chronic care units is usually the lowest.

Key words: *chronic care patients, elderly, incontinence assessment/rehabilitation, nursing shifts, urinary incontinence.*

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INTRODUCTION

Background

Approximately 55 percent of all nursing home residents experience chronic urinary incontinence (5). This is a major problem that has serious medical, psychological, social, and economic consequences (11,12). Medical problems associated with incontinence include cystitis, urosepsis, pressure sores, perineal rashes, and falls. Psychological and social consequences include depression, isolation, embarrassment, and institutionalization (2,4).

Problem

Assessment of incontinence severity in chronic care patients is difficult because of the presence of cortical impairment common among that population. Methods for measuring urine loss are usually subjective and involve periodic checking of bedding or clothing by nursing staff to estimate the amount of urine loss. Questionnaires and diaries kept by chronic care inpatients usually fail to yield reliable incontinence information due to the inability of the patient to accurately record incontinence events. Accurate information about the frequency of episodes, volume of involuntary urine loss, and time of day that incontinence episodes occur is not readily available.

Approach

If the incontinence behavior could be established in these patients, it would provide a rational

basis for toileting schedules, bladder training programs, skin care schedules, and overall patient care management (1,3,7). The severity of incontinence during a nursing shift significantly affects the level of care required for the patient.

When incontinence management programs are oriented to treatment according to incidence, an accurate method is required for measuring incontinence severity. The accuracy of any incontinence measurement method depends on the reliability of the incontinence detection technique and the quantitative assessment of incontinence severity. These factors are ensured by the active role of the nursing staff.

The purpose of this study was to determine urinary incontinence severity in elderly chronic care inpatient men according to each nursing shift as a functional unit of patient management time utilizing a prototype telemetric incontinence detection system. Patients were selected for study by chronic care nursing staff based on observations of involuntary wetness of the patient. The patient or an authorized representative provided informed consent to participate according to an Institutional Review Board approved procedure.

METHODS

System configuration

The electronic incontinence sensor signal/record system consists of a sensor, transmitter, receiver, and recorder. It was designed to measure electrical resistance across electrodes using circuits similar to those used in enuretic alarms for children (6). The sensor was built into a commercial wireless microphone transmitter to provide telemetric incontinence monitoring capabilities (**Figure 1**).

Ten transmitters were assigned separate FM frequencies; corresponding receivers were located at the nursing station. Five receivers were placed in each unit along with a strip chart recorder to record all incontinence episodes (**Figure 2**).

To ensure accuracy, a "request for assistance" button was placed in each transmitter to prevent erroneous signal interpretation. Specifically, this eliminated misinterpreting an unanswered request for assistance while voiding as an episode of incontinence (9).

During this study, each battery-operated sensor worn by the patient transmitted either an incontinence episode signal or a request for assistance

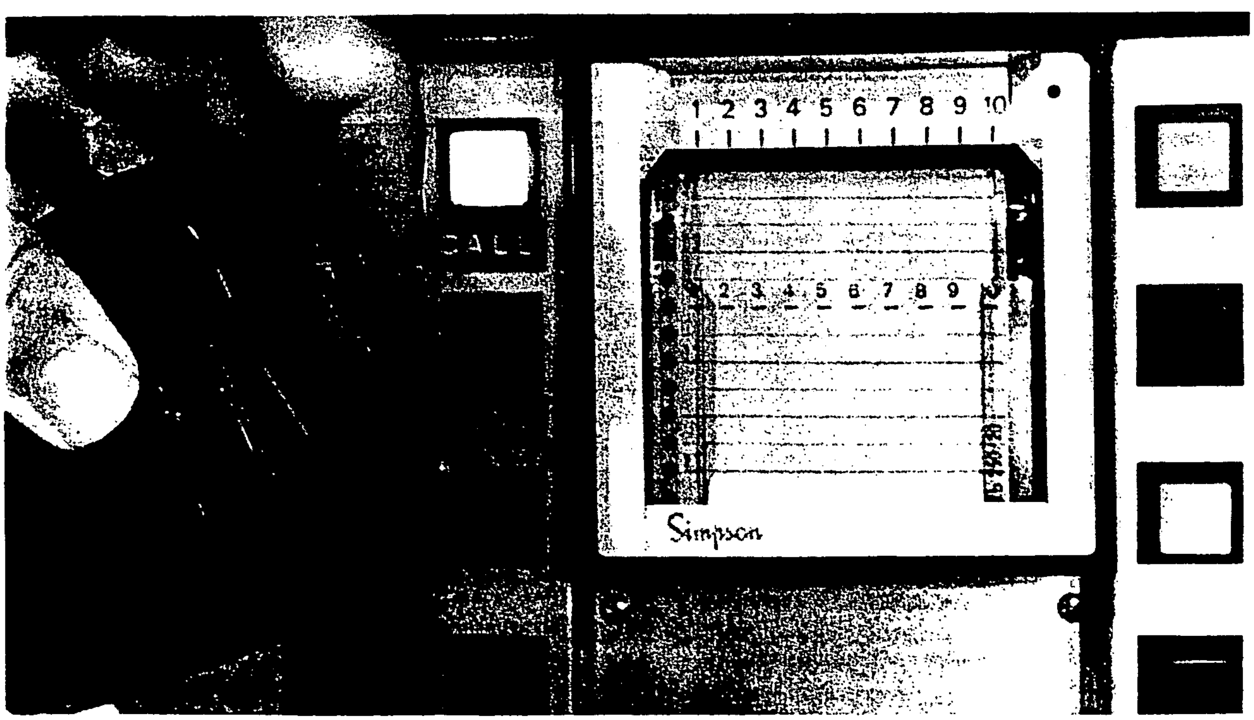

Figure 1.
The sensor-transmitter "request for assistance" results in an alert and identification of the sensor unit by the receiver-recorder.

signal to the receiver for subsequent interpretation. An incontinence episode initialized a red light located adjacent to the corresponding receiver; an intermittent alert tone sounded at the nursing station. A "request for assistance" initialized a yellow light located adjacent to the corresponding receiver; a continuous alert tone sounded at the nursing station.

The sensor transmitter was placed in a convenient location for the patient (**Figure 3**). To generate a signal to the transmitter, the sensor was activated by a decrease in conductance across two electrodes located in the absorbent pad worn by the patient. The electrodes were separated by a 1 cm absorbent gauze pad and calibrated to an activation volume of 5 ml.

Measurement and analysis

Urinary incontinence frequency and volume during each nursing shift were evaluated in 66 chronic care inpatient elderly men over 65 years old (mean 77.5, SD = 9.8) ranging from 65 to 95 years of age. Quantitative incontinence measurement for each patient was performed during the 3-shift 24-hour-day for a total of 10 days. The night nursing shift included the hours from 12 a.m. to 8 a.m., the day nursing shift was 8 a.m. to 4 p.m., and the evening nursing shift was 4 p.m. to 12 a.m. An absorbent pad exchange technique was used for volume measurement (8). Each of 66 subjects had urinary incontinence measurements performed during 30 shifts for a total of 1,980 shifts.

Patients having a Foley catheter or a residual urine volume greater than 100 ml were excluded from evaluation. Patients were not excluded on the basis of ambulatory status or mental status. Forty-seven patients used an external catheter for containment of involuntary urine loss and 19 patients used absorbent pads or periodic garment changes. These patients had not received any treatment for urinary incontinence for at least 2 months prior to this study.

The frequency of incontinence episodes and volume of urine loss were analyzed by repeated measure analysis of variance because data on each patient consisted of matched triples representing each of the three nursing shifts. The p value for the test of the null hypothesis of "no difference in shift means" was 0.001 or less in each of the three analyses. Significant differences were found to exist

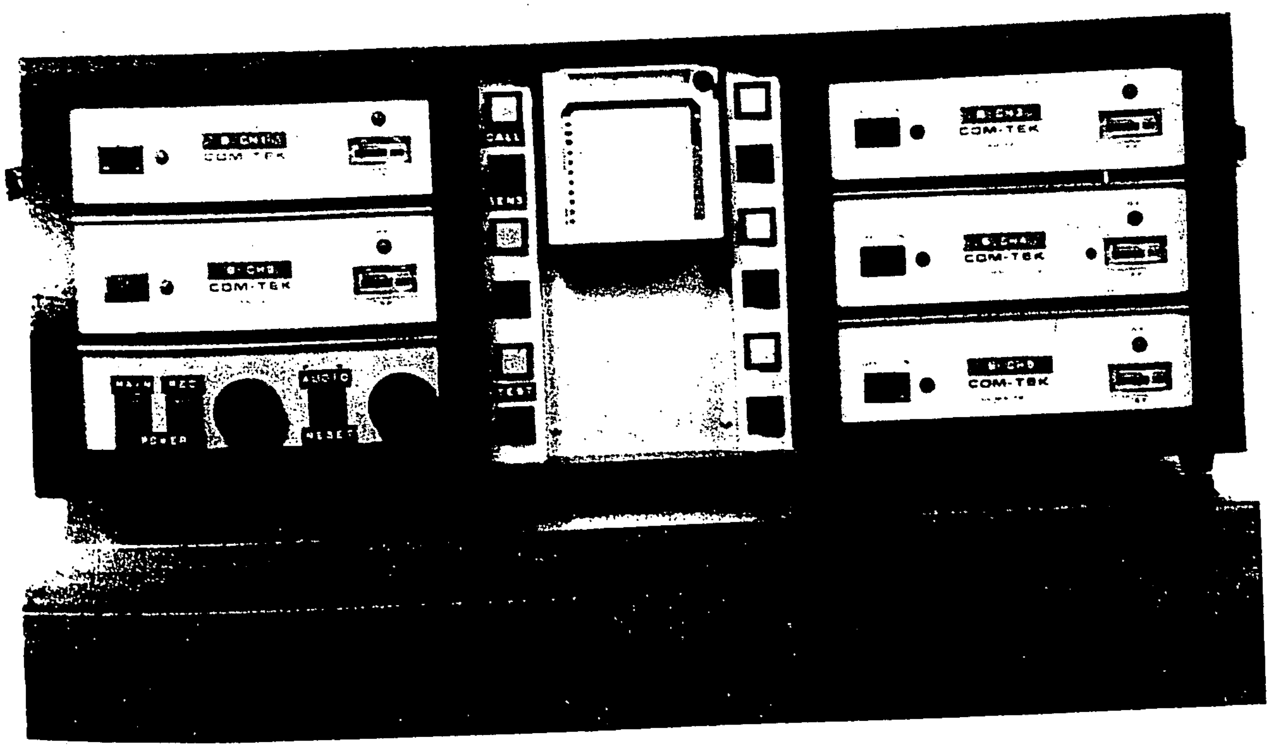

Figure 2.
The receiver-recorder is located at the nursing station for telemetric incontinence monitoring of incontinent patients.

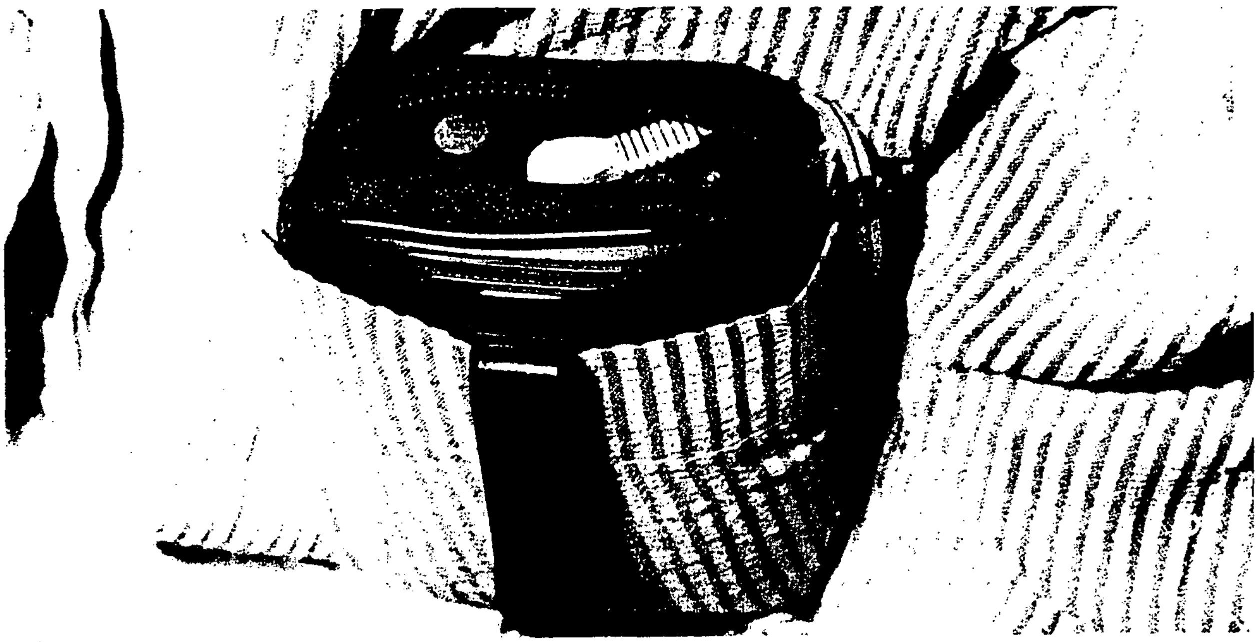

Figure 3.
The sensor-transmitter is worn by the patient in a manner that is most convenient for him.

with each of the three measures of incontinence (**Table 1**).

Voluntary voiding was observed in all patients evaluated. Voluntary voiding by these patients was considered part of their continent behavior. Procedures were avoided which could alter that behavior in order to achieve an accurate measurement of the voluntary voided volume. In addition, control of the volume of fluid intake by the patient or measurement of the fluid intake was avoided because it would have required measurement techniques that would have altered the chronic care environment of the patients.

RESULTS

Overview

Of the 1,980 shifts measured, incontinence episodes occurred during 1,697 patient/nursing shifts (86 percent) while 283 patient/nursing shifts (14 percent) had no episodes. Forty-three patients (65 percent) had one or more incontinence-free nursing shift during the 10-day measurement, while 23 patients (35 percent) had incontinence episodes during all nursing shifts.

A significantly higher number of incontinence episodes occurred during the evening shift when compared with either the day shift or the night shift.

Table 1.
Incontinence measures during each nursing shift (mean total per patient over 10 days).

(A) Number of episodes (SD = 6.77):
Ordered shift means (N = 66)

Day	Evening	Night
16.38*	21.62	17.76*

(least significant difference at .05 = 2.78)

(B) Total volume in cc's (SD = 9995):
Ordered shift means (N = 66)

Day	Evening	Night
1459	1896	2402

(least significant difference at .05 = 166)

(C) Volume/episode in cc's (SD = 42):
Ordered shift means (N = 66)

Day	Evening	Night
79.108+	84.89+	124.4

(least significant difference at .05 = 17.24)

The standard deviation is equal to the pooled root mean square difference between shifts on individual patients (value from repeated measures analysis of variance). The least significant difference is the product of the two-tailed Student-t value at the stated level (130 degrees of freedom), the pooled Standard Deviation and the square root of 2 divided by 66. Dividing the significance level for each comparison by the number of comparisons (three) is the Bonferroni adjustment that insures an overall error rate of no more than the desired .05 level.

*The number of episodes occurring during the day nursing shift and during the night nursing shift is not significantly different at the .05 level.

+The volume per episode during the day nursing shift and evening nursing shift was not significantly different at the .05 level.

Episode comparison

Although the highest incidence of incontinence episodes occurred during the evening shift (**Figure 4**), the largest volume of urine loss occurred during the night shift (**Figure 5**). The higher volume of urine loss and lower number of episodes during the night nursing shift resulted from an increase in the mean volume of urine loss per incontinence episode (**Figure 6**). Conclusively, the incontinence volume episode during the night was significantly higher either the day or evening shift.

Relationships

The total number of incontinence episodes during the first 5-day measurement period for all three nursing shifts was compared with the second 5-day measurement period to determine a test-retest reliability of the incontinence detection system. The showed a 0.88 correlation coefficient for the measurement intervals. In addition, a comparison of the mean values of the total number of incontinence episodes was performed using a one-way analysis of variance with repeated measures. There was no significant difference between the mean number of episodes detected during the first 5-day measurement and the mean number of episodes detected during the second 5-day measurement ($p > 0.05$).

Accuracy

These data show that no treatment effect occurred during the measurement period. Further, the test-retest reliability measurements show the incontinence telemetry detection system to be a reproducible method for detection of urinary incontinence in elderly chronic care inpatients.

Validity testing of the telemetric incontinence system was performed during a pilot study comparing the electronic sensor system with hourly wet checks for detection of urinary incontinence (10). The results of that study showed a 99.7 percent accuracy in the telemetric incontinence detection system when compared with hourly wet checks for measurement validation.

The "request for assistance" signal feature was used by patients to seek assistance for needs not related to voiding. It was rarely used for voiding assistance. This suggests that the patients had the capacity to use the option, but a need to void was not perceived long enough preceding an incontinence episode to allow activation of the "request for assistance" signal.

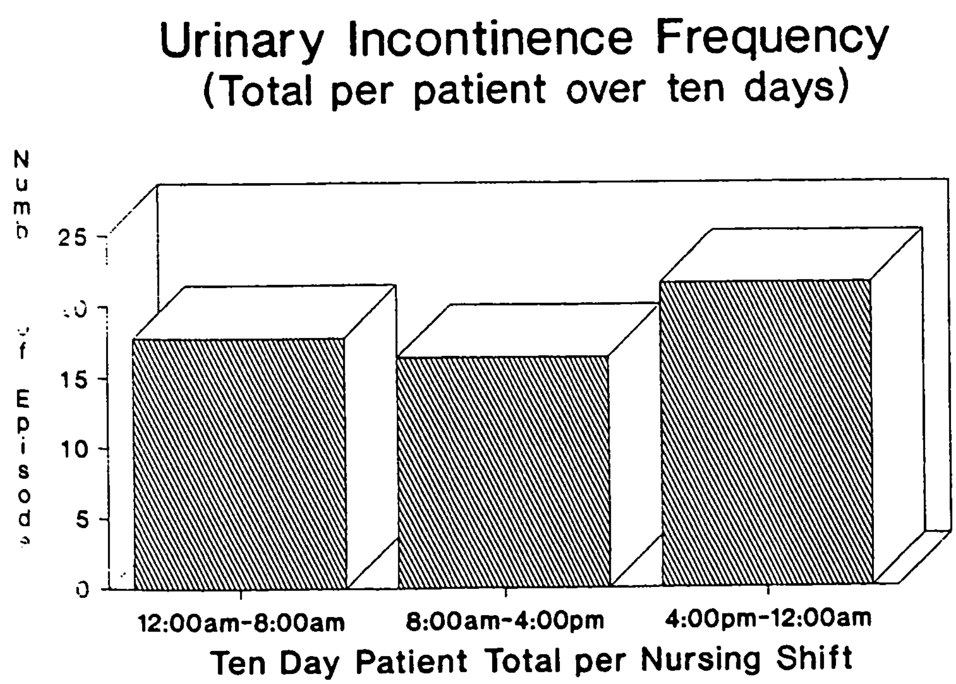

Figure 4.
The mean number of incontinence episodes per patient over a 10-day measurement period is shown according to the nursing shift during which the episodes occurred.

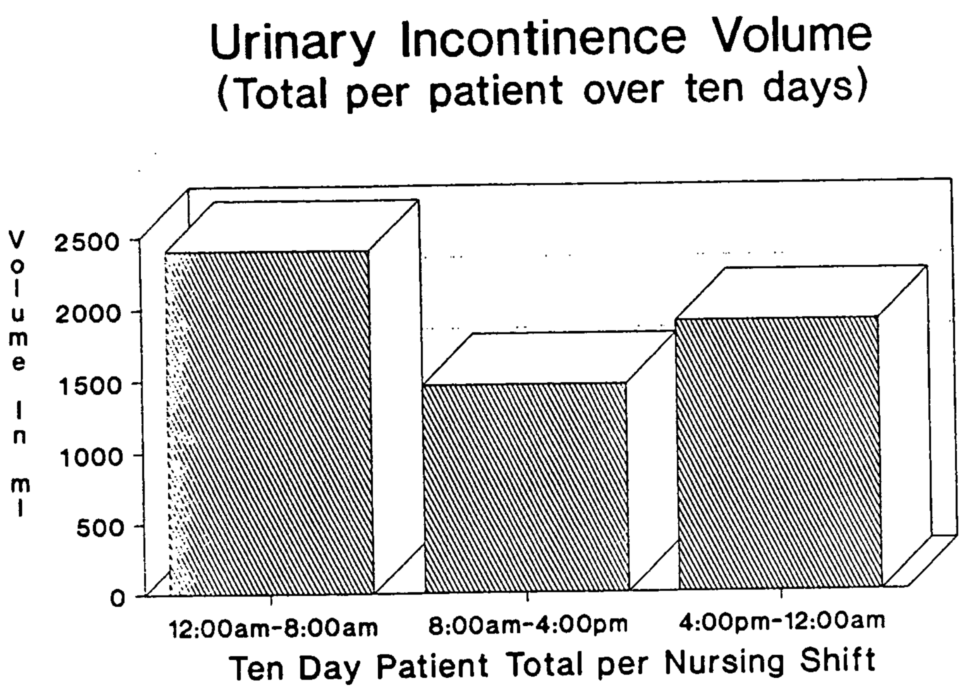

Figure 5.
The mean volume of urine loss per patient over a 10-day measurement period is shown according to the nursing shift during which the volume loss occurred.

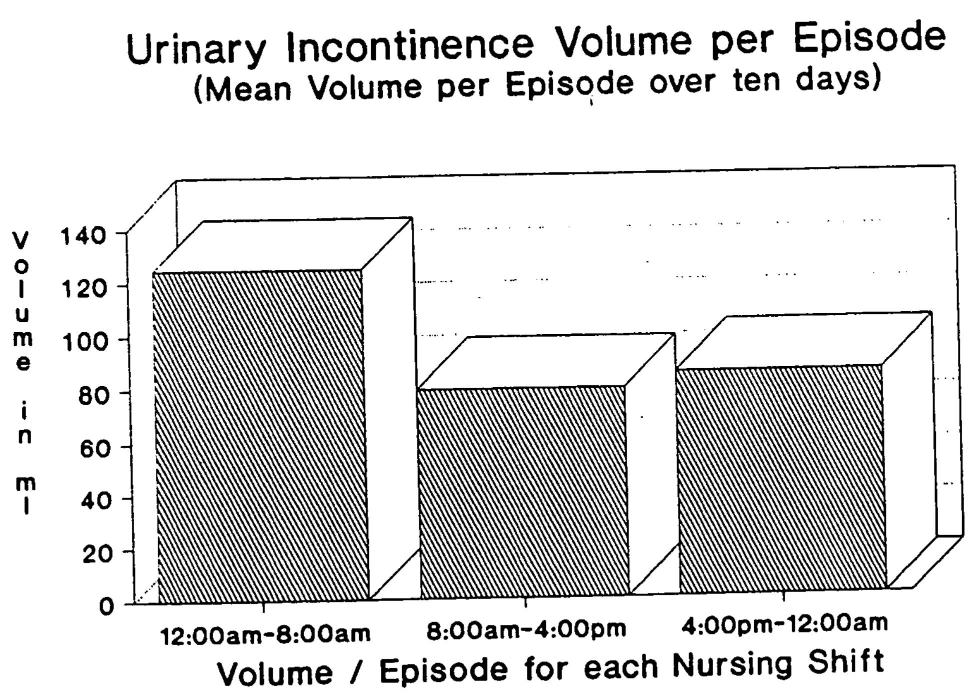

Figure 6.
The mean volume of urine loss per episode of incontinence is shown over a 10-day measurement period according to the nursing shift during which the incontinent episode occurred.

DISCUSSION

For any management program in elderly chronic care inpatients to be effective, it must be practical and feasible. Most management programs for these patients involve a significant effort by the nursing staff. It is essential that chronic care nursing staff are cognizant of patient care concepts.

The first step in implementing patient care programs in the chronic care environment is to accurately assess the patient management problem. Of the different management alternatives for treatment of incontinence, habit training is the most widely used behavioral method for controlling incontinence in elderly nursing home residents. Thus, habit training programs involve treatment primarily during the day nursing shift when the incidence of incontinence and volume of urine loss are the lowest.

Coordination of a treatment schedule with known patient incontinence patterns has not been a feasible part of behavioral therapy regimens in the past. On chronic care units, the number of nursing staff during the evening and night shift is usually lower than during the day. Because of the higher frequency and volume of incontinence during those shifts, longer periods of skin exposure to urine is possible due to unrecognized episodes of incontinence.

The pattern of incontinence during the evening and night nursing shift represents a potential source of skin problems for many incontinent patients. Skin care programs related to urinary incontinence are usually more intensive during the day when the level of incontinence is the lowest, according to this study.

The measurement of incontinence in chronic care inpatients is a difficult problem because of the prevalence of cortical impairment. A non-obtrusive method of accurately detecting incontinence in this group is required for accurate measurement.

With more accurate and less invasive incontinence measurements methods, establishing incontinence patterns for chronic care patients may become feasible. In the future, use of incontinence information can become a part of planning incontinence rehabilitation programs as well as management programs for resulting medical problems.

CONCLUSION

Urinary incontinence severity is determined primarily by frequency of episodes and volume of involuntary urine loss. Although the highest frequency of involuntary urine loss occurred in 66 subjects during the evening nursing shift, the largest volume of incontinence occurred during the night nursing shift. A point worthy of consideration is that the lower level of physical activity during the night may account for the observed changes in incontinence frequency. In addition, supine position may result in mobilization of interstitial fluid, which could be a factor in the higher incontinence volume during the night.

The telemetric incontinence system discussed in this article has quality control and convenience features that make it practical for chronic care nursing staff. This system has demonstrated validity and reliability for detecting urinary incontinence episodes. In addition, it has a low level of obtrusiveness to the patient. It has been shown not to produce a treatment effect resulting from the measurement process.

In planning approaches to management of urinary incontinence in elderly inpatients, consideration needs to be given to the level of incontinence according to time of day for the therapeutic program to be most effective. Because patient management schedules are different during each shift, nursing-oriented incontinence rehabilitation strategies are needed.

In the future, measuring and evaluating individual incontinence behavior will promote management approaches such as pharmacologic therapy or voiding schedules with known incontinence patterns. This approach will assuredly maximize the effectiveness of the treatment program.

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